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Compilation of

Tree Measurement Data

By Hand or Computer

by Paul M. Haack

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FOREWORD

Tree measurement data are continually being collected for research and administrative purposes. Once on hand, these data, to be useful, must be reduced before they can yield meaningful results. The compilation process is often arduous and time consuming. Presented here are ways to improve and speed up this task.

High-speed computers are in common use for certain forestry operations. Undoubtedly, such computers will be used with greater frequency in the future. Nevertheless there are many places and instances where desk calculators are being used and will continue to be used. Both methods for compiling data have been considered.

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COMPILATION OF TREE MEASUREMENT DATA

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By

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SUMMARY

A method for compiling tree measurements by hand or computer is presented along with the work form and procedures for its use.

A part of the form is used to tabulate the necessary identification and measurement data from which IBM cards can be punched and, in turn, processed by a computer. The chief output of the FORTRAN program, written for the IBM 1620, is cubic-foot volume by Smalian's formula for specified portions of the stem, and International 1/4-inch and Scribner board-foot volumes for sawtimber-size trees.

The cross-sectioned part of the form can be used for a graphical solution of cubic-foot volume and the estimation of the diameter and bole length at any point on the tree.

The computer program will need little, if any, adjustment to be usable elsewhere when any of the three volume classes is desired.

1/ Research Forester and, since 1961, the biometrician for the Experiment Station.

THE PROBLEM

Tree volume tables or equations for some areas and species are either nonexistent or could benefit from revision because of changing standards and inadequate samples. Also, particularly when no equation is developed, differences between diameter limits and practices of obtaining stem measurements on various projects result in tables not specifically applicable to each other's needs. Much past data are directly usable; others require partial adjustment by arithmetic or graphical means; with some there is uncertainty as to butt swell or inconsistencies in measurements. Finally, to facilitate incorporating existing tree measurement data with that being currently obtained, it is desirable to standardize the recording and compilation of all such information.

SCOPE

The Tree Measurements form (fig. 1), which is described below, is well suited for longhand computation of cubic-foot volumes for specified portions of the stem, either graphically or by Smalian's formula or any other similar formula. Hand methods for determining board-foot volumes by 16-foot logs are done by table look-up or by formula for results comparable to computer output.

The computer program (fig. 2) solves cubic-foot volume inside bark, using Smalian's formula, for four levels of utilization. Board-foot volumes are computed from equations for the International 1/4-inch rule and Scribner rule in 16-foot logs to the closest log. Cubic-foot ratios, board-foot/cubic-foot ratios, form, and the number of sawlogs are also found. Descriptive information concerning the tree, too, is part of the output.

Complete generalization of the computer program is impossible. Yet, for example, few, if any, changes are needed when utilization limits differ from those herein described. Re-defining the intent of some of the codes often will suffice to broaden the program's utility.

COMPILATION METHODS

Field data are recorded on the Tree Measurements form. The small block at the top of the form contains descriptive information pertaining to the tree which, if machine computation is employed, will be duplicated in the first 35 columns of the IBM cards for that particular tree. Also, if machine computation is used, columns 1, 2, 3, 6, and 7 in the large block on the form will be punched in card columns 36 through 49. Thus, each row in the large block for which entries are made will require one IBM card; columns 1 through 35 of the IBM card contain descriptive material for the tree; columns 36 through 49 contain the specific information for the section of the tree.

Double bark thickness (coded D.B.T. in column 6 of the large block) is not used in the FORTRAN program. However, by punching it and diameter inside bark (coded D.I.B. in column 7 of the large block), bark ratios could be found later.

Note that the decimal places are implicit and are not key-punched in the cards.

Tree Measurement Form Entries Described

Following is a description of each entry on the Tree Measurements form--its definition, intent, and IBM coding.

Upper small block.--The portion of the block above the double line lists descriptive information for the tree which is duplicated on all cards for that tree (one card for each tree-section). Information below the double-line is not coded for IBM use.

Nomenclature on form	IBM coding: Name	IBM coding: Digits[1/]	IBM coding: Columns	Definition
Tree No.	NOTRE	xxx	1-3	Tree number.
Area	Left part EI1	xxx	4-6	Left digit--subregion; right two digits--unit.
Spp.	Right part EI1	xx	7-8	Species code. Hardwoods coded 70 or over; softwoods under 70.
Age	Left part EI2	xxx	9-11	Age at stump.
Type	Right part EI2	xx	12-13	Local forest type.
Elev.	Left 2 digits of EI3	xx	14-15	Elevation in hundreds of feet.
FCC.	Next 2 digits of EI3	xx	16-17	Form class code: 01 $\frac{\text{DIB } \frac{1}{2} \text{ Ht. above B.H.}}{\text{DIB at B.H.}}$ 02 $\frac{\text{DIB } \frac{1}{2} \text{ Ht. above swell}}{\text{DIB above swell}}$

Continued

Nomenclature on form	IBM coding: Name	Digits [1/]	Columns	Definition
FCC.	Next 2 digits of EI3	xx	16-17	Form class code: 03 DIB @ top first log / DOB at BH 04 DIB @ top first log / DOB above swell 05 (Specify numerator) / (Specify denominator)
CuC.	Next 2 digits of EI3	xx	18-19	Cu. ft. vol. determination code: 01 Smalian's 02 Graphic 03 (Specify)
Bd. C.	Right 2 digits of EI3	xx	20-21	Bd. ft. vol. determination code: 00 None 01 International 1/4-inch 02 Scribner 03 Both Int. and Scribner 04 (Specify)
D.B.H.	DBH	xxx	22-24	Diameter breast high o.b. (4-1/2 ft. above ground on uphill side) or, in case of swell-butted trees, D.O.B. 1 foot above swell.
Height	HT	xxxxx	25-29	Total height, ground to tip.
FN.	FN	xxx	30-32	Value of numerator of form class ratio given in FCC.
FD.	FD	xxx	33-35	Value of denominator of form class ratio given in FCC. FD>0.

Continued

Nomenclature on form	IBM coding: Name	IBM coding: Digits[1]	IBM coding: Columns	Definition
Location	--	--	--	Write-in for locality.
Field--date, by	--	--	--	Write-in for field party and date.
Office--date, by	--	--	--	Write-in for office checker.

1/ All decimal points implicit--none punched in IBM cards.

Upper large block.--This portion of the form lists specific entries for each section of the tree from ground to tip. If tree volume compilations are to be done on the computer, only columns 1, 2, 3, 6, and 7 are keypunched in IBM cards. No further columns need be considered unless hand calculations are made. Each row requires an individual IBM card.

Nomenclature on form	IBM coding: Name	IBM coding: Digits[1]	IBM coding: Columns	Definition
Section	--	--	--	--
No.	NOS	xx	36-37	Sequences numbering of section.
Kind	KINDS	xx	38-39	Labels section as to its location in stem. For example ---------
01				Interior Alaska--section reaching 1-ft. stump (or as specified).
				Coastal Alaska--section reaching stump equal in height to D.B.H. but not under 2 ft. or over 4-1/2 ft. (or as specified).
02				Interior--section reaching 2-ft. stump (or as specified).
				Coastal--open.
03				Open.
04				Interior and Coastal--section (s) reaching D.B.H. or D.O.B. above swell.

Continued

Nomenclature: on form	IBM coding: Name	Digits[1]	Columns	Definition
05	Interior and Coastal PT[2]--section (s) above D.B.H, but not reaching 8.0-, 6.0-, or 4.0-inch D.I.B. tops or the tip, having lengths not over 8.15 ft.			
	Interior and Coastal ST[2]--section (s) above D.B.H. terminating at the ST tops[3] in lengths not over 8.15 ft. such that log-intervals of 16.3 ft. accumulate from the stump (coded KINDS "01") as the ST top is approached or reached. Even if the 6.0- or 8.0-inch D.I.B. points occur at or below the ST top, code the section(s) reaching it KINDS "05" to get cubic-foot volume to this point.			
06	Interior and Coastal--section (s) reaching the 8.0-inch D.I.B. point in PT, or in ST where this point occurs above the ST top.			
07	Interior and Coastal--section (s) reaching the 6.0-inch D.I.B. point in PT, or in ST where this point occurs above the ST top.			
08	Interior and Coastal--section (s) reaching the 4.0-inch D.I.B. point in PT or in ST.			
09	Interior and Coastal--the section (just one) reaching the tip.			
Length(ft.)	SLGTH	xxxx	40-43	Length of section in feet and hundredths. Two decimal places.
Cumul. Length(ft.)	--	--	--	Cumulative length of sections to this point. Total for tree is also entered in SMALL BLOCK item "Height". Two decimal places.
D.O.B.(in.)	--	--	--	Diameter outside bark at the top of the section. One decimal place.
D.B.T.(in.)	DBT	xxx	44-46	Double bark thickness at the top of the section. One decimal place.

Continued

Nomenclature on form	IBM coding: Name	IBM coding: Digits[1]	IBM coding: Columns	Definitions
D.I.B.(in.)	DIB	xxx	47-49	Diameter inside bark at the top of the section. One decimal place.
$(D.I.B.)^2$ (sq. in.)	--	--	--	Cross-sectional area in sq. in. at top of section. Two decimal places.
B.A.(sq. ft.).	--	--	--	Cross-sectional area in sq. ft. at top of section. Three decimal places.
Volume	--	--	--	--
Cubic Feet	--	--	--	Cu. ft. volume computed by method given in SMALL BLOCK item "CuC." (By Smalian's formula in present computer program.) Two decimal places.
Board Feet	--	--	--	--
Int. 1/4	--	--	--	Bd. ft. volume obtained by International 1/4" rule. One decimal place.
Scribner	--	--	--	Bd. ft. volume obtained by Scribner rule. One decimal place.

1/ All decimal points implicit--none punched in IBM cards.

2/ Forest Survey: PT is poletimber-size tree from the 5-inch D.B.H. class up to 9.0 inches D.B.H. in Interior conifers and up to 11.0 otherwise. ST is sawtimber-size tree above these limits.

Timber Mangt.Res.: Differs in that minimum ST limits are 8.6- and 10.6-inches. (Computer Sense Switch 1 on for Survey, off for Timber Mangt.)

3/ Merchantable ST top taken as 40% of D.B.H. (outside bark) but not less than 8.0 inches D.I.B. in hardwoods and 6.0 in softwoods.

Lower block.--This irregularly-shaped block beneath the large block is for longhand entries. The computer program outputs similar quantities. Briefly, the principal terms involved are as follows:

Term	Meaning
D^2H	D.B.H. x D.B.H. x Total height
F	Form, equal to FN/FD
T, Cu. ft.	Cubic-foot volume, i.b., ground to tip.
M1, Cu. ft.	Cubic-foot volume, i.b., stump to 4.0-inch top.
M1, M/T	Ratio M1, Cu. ft./T, Cu. ft.
M2, Cu. ft.	Cubic-foot volume, i.b., stump to 6.0-inch top.
M2, M/T	Ratio M2, Cu. ft./T, Cu. ft.
M3, Cu. ft.	Cubic-foot volume, i.b., stump to 8.0-inch top.
M3, M/T	Ratio M3, Cu. ft./T, Cu. ft.
Int., Bd. ft.	Board-foot volume, International 1/4-inch rule, in 16-foot logs.
Int., Bd./M.	Ratio Int., Bd. ft./M1, Cu. ft.
Scrib., Bd. ft.	Board-foot volume, Scribner rule, in 16-foot logs.
Scrib., Bd./M.	Ratio Scrib., Bd. ft./M1, Cu. ft.

Cubic-foot ratios express the volume from stump to the 8.0-, 6.0-, and 4.0-inch D.I.B. tops as a proportion of total (ground to tip) volume. Board-foot/cubic-foot ratios express Scribner and International volumes within the sawtimber portion of the bole as a proportion of cubic-foot volume to the 4-inch top. For interior Alaska, the cubic-foot volume to the 8-inch top is figured from a 2.0-foot stump; cubic-foot volumes to the 6- and 4-inch tops, and board-foot volume, are computed from a 1.0-foot stump. For coastal Alaska, all volume computations, except for total, are normally made from a stump height equal to D.B.H. between the fixed limits of 2- and 4-1/2 feet. However, any stump height not over 4-1/2 feet may be specified, since the computer recognizes it as KINDS 01. For both areas, the sawtimber top is taken as 40 percent of D.B.H. but not under 8.0 inches D.I.B. in hardwoods and 6.0 inches D.I.B. in conifers.

Cross-section paper.--This portion of the form permits graphic determination of the cubic-foot volume. The scale is 10 x 10 to the inch. Table 1 offers guides to estimate the scale for the x- and y-axes, and conversion factors for various combinations of maximum stump diameters and tree heights.

By plotting and smoothing old tree measurement data, one can compute quite closely the diameters and cumulative height at any point of interest. Entering such information in the data blocks will facilitate keypunching and volume compilation.

Computer Program

The FORTRAN program was written for the IBM 1620 having a 20K memory, automatic division, indirect addressing, and a 1622 card read/punch. The debugged program and its accompanying block diagram (fig. 3) are included. Input data cards are prepared as shown under "Tree Measurement Form Entries Described" beginning on page 3. Running time per tree (averaging over 10 input cards each) is about one minute.

Computer Output

Output by computer can be typed and punched or just punched, with two typewritten lines and two cards per tree. Sense Switch 2 on the console controls this option. The first line and output card has all the descriptive tree information and variables necessary for subsequent regression analysis by computer to prepare tree volume equations. The second output card for each tree has supplementary information not directly needed for later regression analysis.

The coding and meaning of the output items for the first typed line or punched card follow:

Code	Meaning
NOTRE	Tree number
EI1	Sub-region, unit, and species.
DBH	D.B.H. or D.O.B. above swell.
TLGTH	Total cumulative length, ground to tip.
F	Form
HTLOG	Number logs to closest 16-foot log.
VSCR	Scribner board-foot volume.
VINT	International 1/4-inch board-foot volume.
VM3	Cubic-foot volume inside bark to an 8.0-inch D.I.B. top.
VM2	Cubic-foot volume inside bark to a 6.0-inch D.I.B. top.
VM1	Cubic-foot volume inside bark to a 4.0-inch D.I.B. top.
VT	Cubic-foot volume, inside bark, ground to tip.

The coding and meaning of the output items for the second typed line or punched card follow:

Code	Meaning
NOTRE	As above
EI1	As above
EI2	Age at stump and local forest type
EI22	Elevation in hundreds of feet
EI3	Form class code, cubic-foot volume determination code, and board-foot volume determination code.
RVSCR	Ratio of VSCR to VM1
RVINT	Ratio of VINT to VM1
RVM3	Ratio of VM3 to VT
RVM2	Ratio of VM2 to VT
RVM1	Ratio of VM1 to VT

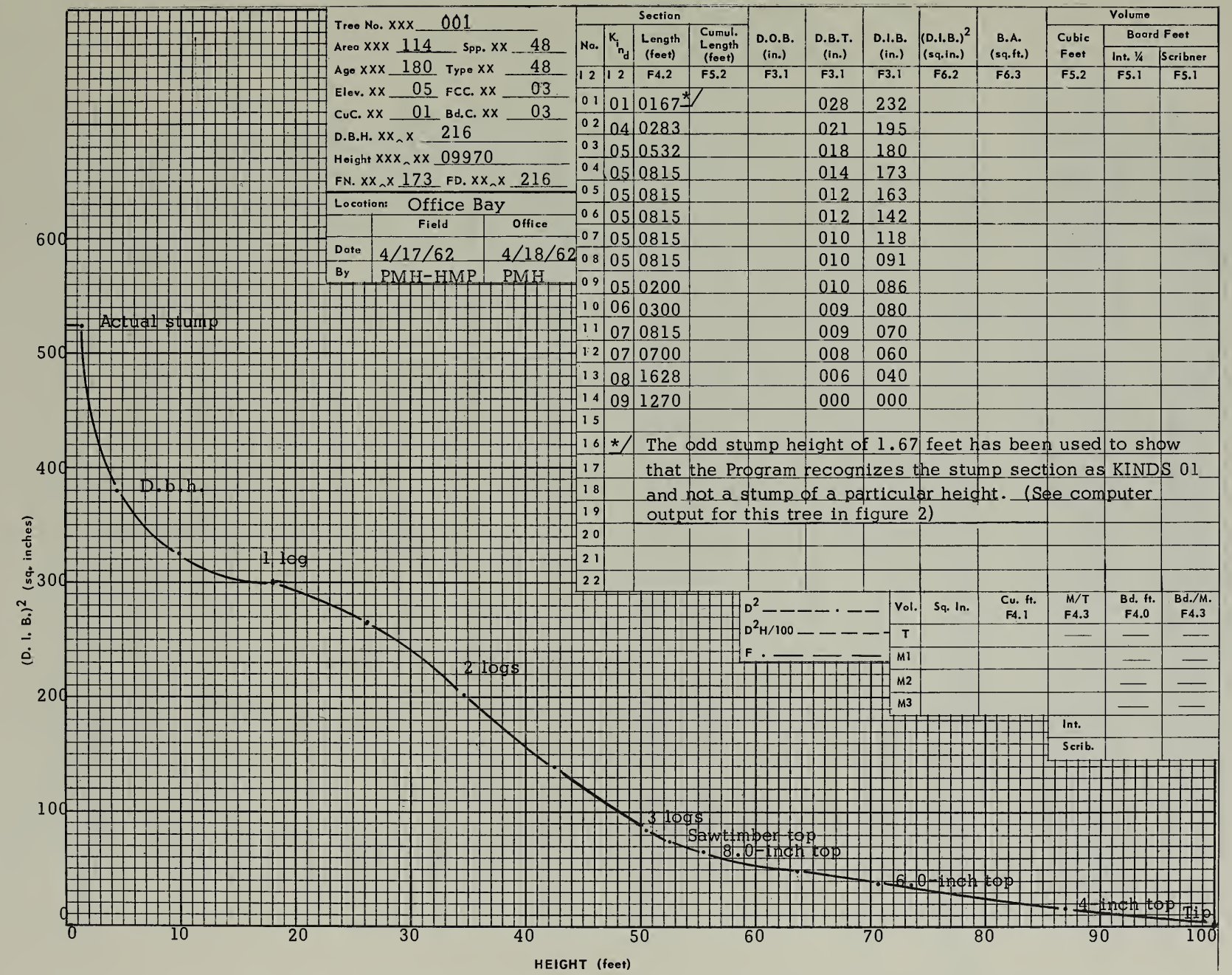

Figure 1.--Tree measurement form developed by the Northern Forest Experiment Station showing sample entries

Table 1.--Guide to estimate intervals for X- and Y-axes and conversion factors for graphic determination of cubic volume for specific maximum stump diameters and tree heights

Maximum d.i.b. at 1 foot stump (inches)	Statistic[1]	Maximum total height of tree (feet)				
		50	100	150	200	[2]250
5.6	Y	4				
	X	5				
	Cf	0.001091				
8.9	Y	10	10			
	X	5	10			
	Cf	.002727	0.005454			
14.0	Y	25	25			
	X	5	10			
	Cf	.006818	.013635			
20.0	Y		50	50		
	X		10	15		
	Cf		.027270	0.040905		
28.2	Y		100	100	100	
	X		10	15	20	
	Cf		.05454	.08181	0.10908	
40.0	Y			200	200	
	X			15	20	
	Cf			.16362	.21816	
48.9	Y				300	300
	X				20	25
	Cf				.32724	0.40905
[2]56.5	Y					400
	X					25
	Cf					.54540
[2]63.2	Y					500
	X					25
	Cf					.68175
[2]89.4	Y					1,000
	X					25
	Cf					1.36350

[1] Y, X -- intervals for the one-inch points on Y- and X-axes.

Cf -- conversion factor to multiply times number of 0.1 inch squares beneath curve, giving cubic foot volume.

[2] Hand compute or use larger graph.

Figure 2.--Listing of FORTRAN program.

```
C  THIS 1620 FORTRAN PROGRAM READS INFO PUNCHED FROM TREE MEAS.FORMS.
C
C  FOR INTERIOR ALASKA SPP.,COMPUTES CU.FT.INSIDE BARK BY SMALIANS FOR
C  GROUND TO TIP,1 FT STUMP TO 4.0 AND 6.0 INCH TOPS,AND 2 FT STUMP TO 8
C  .0 IN. TOP. ALSO,SCRIBNER AND INT. 1/4 INCH RULE VOL.IN 16 FT LOGS--
C  FROM 1 FT STUMP TO 40 PERCENT OF DBH (BUT NOT UNDER 8.0 IN. TOP IN
C  HDWDS. OR 6.0 IN. TOP IN SFTWDS)
C
C  FOR COASTAL ALASKA SPP.,COMPUTES CU FT BY SMALIANS FOR MERCH.STUMP TO
C  8.0,6.0,4.0,AND GROUND TO TIP. ALSO, INT. 1/4 INCH AND SCRIBNER FROM
C  MERCH. STUMP TO TOP DESCRIBED ABOVE.
C
C  OTHER OUTPUT IS TREE NO.,AREA,SPP.,DBH,T.HT,FORM,3 CU FT VOL.RATIOS,
C  BD FT/CU FT RATIOS,AND NO. OF LOGS.
C  OUTPUT--2 PRINTED LINES AND 2 CARDS PER TREE.
C
C  PAUL M HAACK,NOR.FOR.EXP.STA.,JUNEAU,ALASKA,REV.12/31/62.
C
C  OPERATOR---CLEAR MEMORY AND TABS,AFTER ENUF PRINTED ANSWERS ARE
C  VERIFIED,HIT READER STOP,AND WHEN TYPING STOPS,TURN OFF SENSE
C  SWITCH 2,HIT READ START,AND PROGRAM WILL CONTINUE PUNCHING ONLY.
C  SWITCH 1 OFF FOR TIMBER MANGT.ST MINIMUM,ON FOR FOREST SURVEY.
      IF(SENSE SWITCH 9)67,67
   67 IDTRE=0
      TVM2=0.0
      TVM3=0.0
      RVM1=0.0
      RVM2=0.0
      RVM3=0.0
      RVINT=0.0
      RVSCR=0.0
      VT=0.0
      VM1=0.0
      VM2=0.0
      VM3=0.0
      VINT=0.0
      VSCR=0.0
      CLGTH=0.0
      TLGTH=0.0
      HTLOG=0.0
      INOS=0
      ADTO3=0.0
    2 INOS=INOS+1
      READ100,NOTRE,EI1,EI2,EI3,DBH,HT,FN,FD,NOS,KINDS,SLGTH,DBT,DIB
  100 FORMAT(13,F5.0,F5.0,F8.0,F3.1,F5.2,F3.1,F3.1,I2,I2,F4.2,F3.1,F3.1)
      IF(IDTRE)69,70,69
```

(continued)

```
 70 IDTRE=NOTRE
 69 IF(IDTRE-NOTRE)43,23,43
 23 IF(INOS-NOS) 802,230,802
230 GO TO(3,5,5,5,5,7,7,7,7),KINDS
  3 VT=VT +(DIB*DIB*0.005454*SLGTH)
    STUMP=SLGTH
    BIGDI=DIB
    GO TO 2
  5 AVEBA=(0.005454*( (BIGDI*BIGDI)+(DIB*DIB) ) )/2.0
    SECV=AVEBA*SLGTH
    VM1=VM1+SECV
    BIGDI=DIB
    CLGTH=CLGTH +SLGTH
    IF(KINDS-2)801,6,8
  6 ADTO3=VM1
    GO TO 2
  8 IF(30000.0 -EI1)56,56,57
 56 IF(SENSE SWITCH1)352,58
 58 IF(DBH-8.6)320,354,354
 57 IF(SENSE SWITCH1)353,59
 59 IF(DBH-10.6)320,10,10
352 IF(DBH-9.0) 320,354,354
354 I SP=EI1*100.0
    IE(ISP-6900)10,10,57
353 IF(DBH-11.0)320,10,10
 10 IF(DIB-8.0)51,50,110
 50 TVM3=VM1
    GO TO 110
 51 IF(DIB-6.0)54,54,110
 54 TVM2-VM1
110 IF(CLGTH-16.3)2,12,12
320 TLGTH=TLGTH +CLGTH
    CLGTH=0.0
    GO TO 2
 12 VSCR=VSCR+( (0.79*DIB*DIB)-(2.0*DIB)-4.0)
    VINT=VINT+( (0.796*DIB*DIB)-(1.375*DIB)-1.23)
    HTLOG=HTLOG +1.0
    TLGTH =TLGTH +CLGTH
    CLGTH=0.0
    GO TO 2
  7 IF(CLGTH-8.15) 28,30,30
 30 VSCR=VSCR+( (0.79*BIGDI*BIGDI) - (2.0*BIGDI) -4.0)
    VINT=VINT+( (0.796*BIGDI*BIGDI)-(1.375*BIGDI)-1.23)
    HTLOG=HTLOG +1.0
 28 TLGTH=TLGTH +SLGTH +CLGTH
    CLGTH =0.0
    AVEBA=(0.005454*( (BIGDI*BIGDI)+(DIB*DIB) ) )/2.0
    SECV=AVEBA*SLGTH
    GO TO (800,800,800,800,800,32,34,36,38), KINDS
```

(continued)

```
 32 VM1=VM1 +SECV
    VM3=VM1
    GO TO 360
 34 VM1=VM1+SECV
    VM2=VM1
    GO TO 360
 36 VM1=VM1+SECV
360 BIGDI=DIB
    GO TO 2
 38 VT=VT+( (BIGDI*BIGDI*0.005454*SLGTH)/2.0)+VM1+0.05
    TLGTH=TLGTH+STUMP
    IF(HT-TLGTH)40,20,41
 40 IF(HT-(TLGTH-1.0) ) 803,20,20
 41 IF(HT-(TLGTH+1.0) ) 20,20,803
 20 VM1=VM1 +0.05
    IF(VM1 -0.05)358,358,359
358 VM1=0.0
    RVM1=0.0
    GO TO 362
359 RVM1=(VM1/VT)+0.0005
362 IF(TVM2) 364,364,363
363 VM2=TVM2 +0.05
    GO TO 367
364 IF(VM2) 366,366,365
365 VM2=VM2 +0.05
367 RVM2 =(VM2/VT)+0.0005
366 IF(TVM3) 370,370,369
369 VM3=TVM3 +0.05 -ADTO3
    GO TO 373
370 IF(VM3) 372,372,371
371 VM3 =VM3 +0.05 -ADTO3
373 RVM3=(VM3/VT)+0.0005
372 IF(VINT)42,42,355
355 VINT=VINT +0.5
    RVINT=(VINT/VM1)+0.0005
    VSCR =VSCR +0.5
    RVSCR=(VSCR/VM1)+0.0005
 42 F=FN/FD
    IE3=EI3/1000000.
    EI22=IE3
    DI22=EI22*1000000.
    EI3=EI3-DI22
    IF(SENSE SWITCH 2) 208,209
208 PRINT1,NOTRE,EI1,DBH,TLGTH,F,HTLOG,VSCR,VINT,VM3,VM2,VM1,VT
  1 FORMAT(I4,F7.0,F5.1,F7.2,F5.3,F4.0,F6.0,F6.0,F6.1,F6.1,F6.1,F6.1)
    PRINT 201,NOTRE,EI1,EI2,EI22,EI3,RVSCR,RVINT,RVM3,RVM2,RVM1
201 FORMAT(I4,F7.0,F7.0,F4.0,F8.0, F6.3,F6.3, F6.3,F6.3,F6.3//)
209 PUNCH1,NOTRE,EI1,DBH,TLGTH,F,HTLOG,VSCR,VINT,VM3,VM2,VM1,VT
    PUNCH 201,NOTRE,EI1,EI2,EI22,EI3,RVSCR,RVINT,RVM3,RVM2,RVM1
    IF(SENSE SWITCH 9) 206,67
```

(continued)

```
  206 PRINT 207
  207 FORMAT(48HYOU HIT READ START TO GET LAST CARD, PROGRAM DONE//)
      STOP
   43 PRINT  202
  202 FORMAT(41HCHECK TREE NO., CORRECT, REPLACE, PUSH START//)
      PAUSE
      GO TO 23
  800 STOP
  801 STOP
  802 PRINT 203
  203 FORMAT(44HCHECK SECTION NO., CORRECT, REPLACE, PUSH START//)
      PAUSE
      GO TO 230
  803 PRINT 204
  204 FORMAT(46HCUMUL. HT. OFF OVER FT. FROM HT, MAYBE RERUN TREE//)
      PAUSE
      GO TO 20
      END
```

(THREE OUTPUT EXAMPLES)

```
+1+11448.+21.6+99.70+.800+3. +368. +405. +68.6 +72.7 +75.0 +80.5
+1+11448.+18048. +5. +30103. +4.907+5.402 +.852 +.904 +.932

+35+33144. +8.9 +50.00+.820 +.  +.  +.  +.0  +8.7 +10.1 +11.0
+35+33144. +7041.+10. +30100. +.000 +.000 +.000 +.792 +.922

+36+33144. +9.0 +50.10+.811 +2.  +36.  +50.  +.0  +8.8 +10.2 +11.1
+36+33144. +7041.+10. +30101.+3.540+4.938 +.000 +.794 +.923

YOU HIT READ START TO GET LAST CARD, PROGRAM DONE


STOP
```

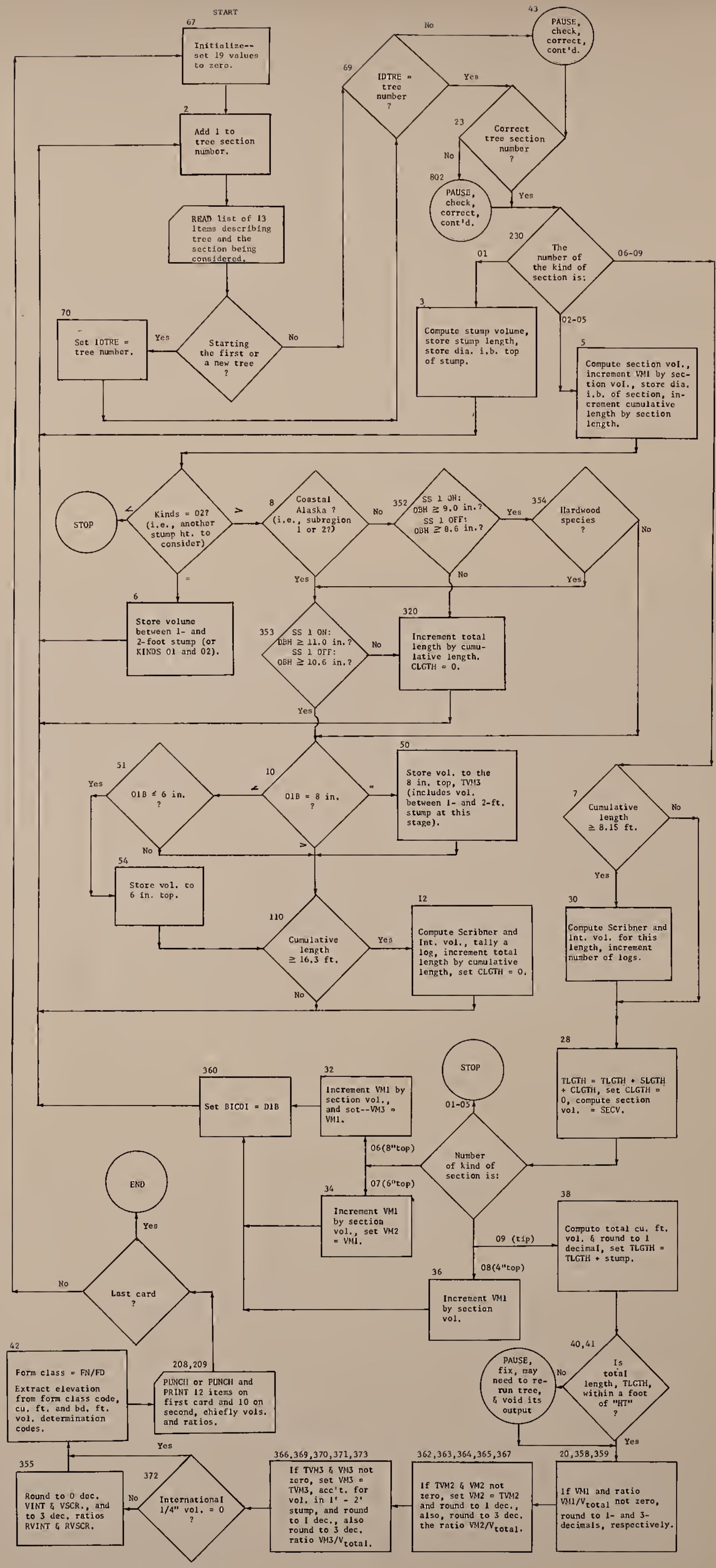

Figure 3.--Block Diagram of FORTRAN Program.

Haack, Paul M.
1964. Compilation of tree measurement data by hand or computer. USDA, Forest Serv., Northern Forest Expt. Sta., Juneau, Alaska. 17 pp.

Presenting ways to improve and speed up the task of compiling tree measurement data for research and administrative purposes.

Haack, Paul M.
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